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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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10/751,898

01/07/2004

Shosuke Endoh

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11/27/2009

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EXAMINER

MACARTHUR, SYLVIA

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

11/27/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|--|-------------------------------------|--|
| Office Action Summary | Application No. 10/751,898 | Applicant(s) ENDOH ET AL. | |
| | Examiner Sylvia R. MacArthur | Art Unit 1792 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 14-19, 22-25, 28 and 30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 14-19, 22-25, 28 and 30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 8/31/2009 have been fully considered but they are moot considering the amendment to claims 1 and 14 wherein the clarification of the structural relationship between the substrate, lower ring body, and ring member has necessitated the re-introduction of Ma et al (US 6,554,954) and Hubacek (US 6,475,336).

2. It is noted that none of this prior art anticipates the limitation of claim 1 reciting that the height of the upper surface of the lower ring body is lower than the height of the second surface. However, this limitation is interpreted as a matter of design choice and as an alternative to the construction of the prior art. This point will be expounded upon more below.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1- 8, 10, 11, 14-17, 19, 23, 25 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al (US 6,554,954).
Ma et al teaches a conductive collar surrounding a semiconductor workpiece in a plasma chamber. Refer to Figs. 1, 2, 4, and 5.

Regarding claims 1 and 14: The apparatus comprises a plasma processing chamber (abstract), a (metal is both electrically and thermally conductive, see col. 3 lines 1-5) susceptor 22, an electrostatic chuck 26 a ring member 50 (Figs. 1, 2), substantially planar portion of 46

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(Fig. 4), and substantially planar portion of 58 (Fig. 5) and a lower ring body 52(Fig. 2), step portion of element 46 (Fig. 4) and step portion of element 58 (Fig. 5). The size and shape of the substrate is the basis of the location of the ring member and lower body which is not part of the apparatus, see *In re Young* as restated in *In re Otto*, wherein the inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims. The examiner opines that the apparatus of Ma is structurally capable of using a smaller substrate such that gap will be as recited. The first and third surfaces of the susceptor of Ma et al are as claimed by the present invention.

Ma et al fails to teach that the second surface as claimed.

It noted that the apparatus of Ma et al teaches a susceptor 22 and separate elements 36, 44, 48. These portions if integrated with the susceptor would meet the height limitation. According to col. 4 lines 40-53 these portions are often eroded by the plasma due to their proximity to the edge of the workpiece. The motivation to integrate these portions with the susceptor would simplify the apparatus making it unitary rather than multiple pieces. The motivation to meet the height requirement is that it would further protect the susceptor surfaces closet to the chuck and workpiece from damage which negatively affects the throughput due to the need to complete susceptor replacement.

Regarding claims 5, 6, 8, 16, 17: The claims depend upon the substrate regarding the material of construction, impedance, and thickness. Note that the invention is held to an apparatus which is what it is and not what it does, such that the substrate is not included in the apparatus, and the apparatus of Ma et al is inherently capable of constructing a ring member relative to the substrate as recited. Note that the inclusion of material or article worked upon by a

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structure being claimed does not impart patentability to the claims. In re Young, 75 F. 2d, 25 USPQ 69.

Regarding claims 10 and 19: The susceptor 22 comprises a conductive lower electrode according to col.2 lines 49-59. How the ring member 58, 50 is formed is a product by process limitation and does not structurally limit the ring member of Ma et al.

Regarding claim 11: The lower ring body 48, 52 of Ma et al could inherently perform the function of protecting the susceptor. The use of the lower ring body does not structurally limit the apparatus.

Claims 2-4, and 15: The dimensions of the ring especially the thickness is related to the impedance according to the specification page 14 of the present invention.

The dimensions of the components of the plasma chamber especially the ring members and lower ring members are a matter of optimization. The thickness of the ring members and lower ring members affect the transport of plasma around the substrate and the amount of protection provided to the substrate edge. It is well settled in that the determination of optimum values of cause effective variables such as the dimensions of the ring and lower ring member is within the skill of one practicing in the art. In re Boesch, 205 USPQ 215 (CCPA 1980). Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to design the lower ring and the ring member to provide optimal thickness that would result in the optimal impedance to produce the optimal amount of plasma to process the wafer.

Regarding claims 7, 23, 25, and 26: The substrate is not part of the apparatus and is seen as a matter of an intended use. Note that the inclusion of material or article worked upon by a

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structure being claimed does not impart patentability to the claims. In re Young, 75 F. 2d, 25 USPQ 69.

Regarding claims 28 and 30: Furthermore the prior art of Ma et al fails to teach the thickness of the substrate as being related to the impedance. The motivation to provide the dimensions of Ma et al within the ranges of claims 5-8 is to provide the optimal physical parameters of protection to the wafer for processing and provide the desired impedance. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide the dimensions of the ring member within the ranges of claims 5-8a and 20 as a matter of optimization.

Regarding claims 12, 21, 26, and 27: Ma Fig. 5 fails to illustrate or teach that the entire upper surface of the susceptor is covered with the electrostatic chuck. Ma teaches in col.2 lines 60-67 that the electrostatic chuck 26 serves to securely hold the workpiece against the front surface of the pedestal (susceptor). Ma illustrates that a majority of the face of the upper surface of the susceptor is covered by the chuck. It is the examiner's position that the motivation to design the susceptor/chuck such that the chuck covers the susceptor's entire upper surface in order to ensure that the workpiece is secured along its entire length and such designing is a matter of optimization. Thus, it would have been obvious for one ordinary skill in the art at the time of the claimed invention to ensure that the workpiece is amply secured onto the susceptor via the chuck.

5. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al in view of Tong et al (US 2004/0083975).

The teachings of Ma et al were discussed above.

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Ma et al fails to teach the materials of construction as discussed in claims 9 and 18 of the claimed invention.

Tong et al teaches a hot edge ring 108 surrounding an electrostatic chuck wherein the chuck is made of such materials as SiC and silicon.

Tong et al teaches that the material of construction of the edge ring the degree of coupling through the plasma can be tailored to provide a desired localized “edge” etch rate at the outer portion of the substrate being processed, see [0026 of Tong et al].

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to construct the ring of Ma et al with the materials disclosed by Tong et al.

6. Claims 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al in view of Hubacek (US 6,475,336).

The teachings of Ma et al were discussed above. Ma et al fails to teach that the whole lower ring is inserted into a groove formed on the susceptor.

Hubacek teaches a plasma processing chamber, a susceptor, an electrostatic chuck 14,36,34,17,50, and a ring member 18, 30, 44, 62, wherein the whole (interpreted as entire) ring member is located directly on the chuck and a lower surface of the ring member is higher than an upper surface of the electrostatic chuck, see Figs.

Hubacek illustrates in Fig. 5 the conventionality of constructing rings so as to fit within a groove (recess) see col.2 lines 18-30 and col. 5 lines 8-33. The motivation of constructing the lower ring of Ma et al so as to fit within a groove of susceptor as Hubacek teaches is a way to ensure that there is a snug fit allowing the ring of Ma to endure the harsh semiconductor manufacturing environment. Thus, it would have been obvious for one of ordinary skill in the art

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at the time of the claimed invention to construct the lower ring to snugly fit within the susceptor via a groove.

Conclusion

7. Applicant's amendment of claim 1 has necessitated the re-introduction of the prior art of Hubacek (US 6,475,336) and Ma et al (US 6,554,954) new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

8. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-Th during the hours of 8 a.m. and 4:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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10. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

November 20, 2009

/Sylvia R MacArthur/
Primary Examiner, Art Unit 1792